REMARKS

Claims 1-9 and 19 are pending. Claims 1-9 and 19 are rejected. Claims 1, 6 and 19 have been amended. The amendments to claims 1 and 19 are an attempt to recite positively the method in the manner sought by the examiner. If the proposed changes are not what the examiner is seeking, applicant requests that the examiner contact the undersigned so that suitable claim language can be approved. Claims 1 and 19 also are amended to recite the metal underlayer "formed of Cr or a Cr alloy," as supported by the second full paragraph on page 10 of the specification. Claims 1-9 and 19 remain in the case.

Claims 1-2, 6 and 8 are rejected under Section 102(b) based on Egelhoff, and claims 9 and 19 are rejected under Section 103(a) based on Egelhoff. The examiner urges that Egelhoff teaches all of the elements recited in claim 1. However, he does not identify the feature of a metal underlayer in Egelhoff. The underlayer in Egelhoff is NiO. Although it contains the metal Ni, it is not properly characterized as a "metal underlayer." NiO is characterized in Egelhoff as a "pinning layer." It is well known by those skilled in the art that NiO is an electrical insulating material and is used as an antiferromagnetic layer which is exchange coupled to the pinned layer, for pinning the magnetic moment of the pinned layer. This clearly differs in function from the metal underlayer in the present claims, and no anticipation of claims 1, 2, 6 and 8, or obviousness of claims 9 and 19 exists based on Egelhoff.

Moreover, Egelhoff relates to GMR, or Giant MagnetoResistance" and not to a magnetic recording media as specified in claim 1. Therefore, on this basis also there can be no anticipation of the present claims, and a person skilled in the art would not have implemented the arrangement of Egelhoff in the context of a magnetic recording media as presently claimed.

In an Advisory Action, the examiner takes the position that the underlayer in Egelhoff is the Co layer, not the NiO layer. This would mean that the substrate in Egelhoff includes the NiO layer. The examiner notes applicant's arguments drawn to the use of Cr or Cr alloys, but notes that these alloys are not recited in the claims. While it is clear that there is no anticipation under Section 102(b) or obviousness under Section 103(a) based on Egelhoff, in order to advance prosecution applicant has amended claims 1 and 19 to recite a metal underlayer formed of Cr or a Cr alloy. Reconsideration and withdrawal of this rejection are respectfully requested.

Claims 3-5 are rejected under Section 103(a) based on Egelhoff in view of JP '032 or Shimizu. Claims 3-5 would not have been obvious based on Egelhoff, alone or in view of any

of the cited secondary references. The reasons why the present claims distinguish over Egelhoff alone are described above and incorporated here by reference.

The advantages of the metal underlayer in the present invention are explained in detail in the section entitled "Metal underlayer" on page 10 of the translated specification of this application. The main points are as follows:

(a) By controlling the grating coefficient of the metal underlayer 2, it is possible to improve the coercive force of the ferromagnetic metal layer 3 formed on the metal underlayer 2;

(b) The use of Cr or Cr alloys in the metal underlayer 2 can cause the ferromagnetic metal layer 3 formed on the metal underlayer 2 to segregate. A high Cr concentration phase resulting from this segregation effect in the crystal grain boundary of the ferromagnetic metal layer 3 can suppress magnetic interactions among crystal grains of the ferromagnetic metal layer 3, and therefore enhance the standardizing coercive force of the medium;

(c) This also can cause the easy axis (c axis) of the ferromagnetic metal layer 3 on the metal underlayer 2 take the in-plane direction of the substrate. In other words, this can accelerate the growth of crystals of the ferromagnetic metal layer 3 in the direction of enhancing the coercive force in the in-plane direction of the substrate; and so on.

As shown in Fig. 6 on page 6146 of Egelhoff, the optimal value of O_2 pressure is 5×10^{-9} Torr in terms of maximizing GMR (giant magnetoresistance), and Egelhoff notes that "the beneficial effect of oxygen exists in a rather narrow window around 5×10^{-9} Torr." By contrast, the range of the partial pressure of oxygen which is effective in this application, and is particularly recited in claims 4 and 5, is considerably different. As shown in Fig. 8 of the present application, the optimal value in terms of KuV/K_BT (an index of thermal stability) is about 10^{-5} Torr, several orders of magnitude different than that in Egelhoff. Thus, it would not have been obvious based on either JP '032 or Shimizu to modify the partial pressure in Egelhoff to this degree, since Egelhoff clearly teaches away from values in the ranges recited in claims 4 and 5. This difference in the optimal value is due to a difference in the configuration, including the difference of the underlayer (metal layer versus the electrically insulating, and hence clearly not

metal, NiO material which is an antiferromagnetic layer which is exchange coupled to the pinned layer) between the invention according to Egelhoff, and the invention of this application.

With respect to claim 3 and JP '032, it is reiterated that JP '032 describes "a magnetic recording medium which greatly decreases a transition noise in a layered magnetic recording layer, excels in an S/N ratio, and is suited for short wavelength recording, the magnetic recording medium includes a vertical magnetic recording film 5 comprising an artificial lattice film formed by alternately layering a Pt or Pd layer and a Co layer and containing B and O elements." The B and O elements are contained in both the Co and Pt layers which constitute the layered magnetic recording layer 5. Thus, JP '032 discloses a perpendicular magnetic recording film that contains B and O, but it includes no teaching or suggestion of the present invention in which oxygen and/or nitrogen are physically absorbed at least at the interface between a nonmagnetic metal spacer layer or layers and ferromagnetic films.

The examiner has clarified in the Final Rejection that JP '032 is only relied upon as "teach[ing] using a mixture of oxygen and/or nitrogen gas with a rare gas such as argon as an operable means for controlling a concentrations of elements to a layer; **rather [sic: than?] teaching a spacer layer being adsorbed with the desired element**" (emphasis added). That is, he agrees with applicant that JP '032 fails to teach that at least the interface between a nonmagnetic metal spacer layer or layers and ferromagnetic films is allowed to adsorb physically oxygen and/or nitrogen. JP '032 does not overcome the failure of Egelhoff to teach or suggest this feature, and therefore claim 3 would not have been obvious based on Egelhoff in view of JP '032.

Shimizu similarly fails to suggest that at least the interface between a nonmagnetic metal spacer layer or layers and ferromagnetic films is allowed to adsorb physically oxygen and/or nitrogen. Like JP '032, it is relied upon merely as teaching that oxygen gas can be diluted with Ar or other rare gases to affect the concentration. Therefore claim 3 also would not have been obvious based on Egelhoff in view of Shimizu. Reconsideration and withdrawal of the rejections based on Egelhoff in view of JP '032 or Shimizu are respectfully requested.

Claim 7 is rejected under Section 103(a) based on Egelhoff in view of either Hartsough or Fukuzawa. Each of these secondary references is merely relied upon teaching that "oxidation may be controlled based upon units of Langmuir for exposure, wherein such units may determine the speed at which oxidation is performed" (Hartsough), and that "the prior art

teaches Langmuir affects the amount of oxygen provided on the targeted surface" (Fujikawa). Neither reference overcomes the failure of Egelhoff to suggest that oxygen and/or nitrogen be physically absorbed at least at the interface between a nonmagnetic metal spacer layer or layers and ferromagnetic films. Reconsideration and withdrawal of the rejections based on Egelhoff in combination with Hartsough or Fukuzawa are respectfully requested.

If there are any problems with this response, or if the examiner believes that a telephone interview would advance the prosecution of the present application, Applicant's attorney would appreciate a telephone call. In view of the foregoing, it is believed none of the references, taken singly or in combination, disclose the claimed invention. Accordingly, this application is believed to be in condition for allowance, the notice of which is respectfully requested.

Respectfully submitted,

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